GSTAR-1D Fact Sheet

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Overview

GSTAR-1D (Generalized Sediment Transport for Alluvial Rivers – One Dimension) is a one-dimensional mobile boundary hydraulic and sediment transport computer model for rivers and manmade canals. Simulation capabilities include steady or unsteady flows, internal boundary conditions, looped river networks, cohesive and non-cohesive sediment transport, and lateral inflows. The model uses cross section based river information.

The model simulates changes to rivers and canals caused by sediment transport. It can estimate sediment concentrations throughout a waterway given the sediment inflows, bed material, hydrology, and hydraulics of that waterway.

Potential Applications

There are potential uses of the model. Specific applications include:

- Identification of areas undergoing geomorphic adjustment or likely to experience future adjustment under current or proposed management plans.
- Quantification of adjustment processes and future conditions.
- Estimation of channel change in a river system caused by dam construction, dam removal, or sediment sluicing.
- Estimation of sediment concentrations in a waterway subject to erosion of deposition.
- Estimates of basin sediment yields.
- Sensitivity analysis and evaluation of the impact of management alternatives in a river system.

Applicability and Limitations

GSTAR-1D uses one-dimensional solutions for flow simulation. It should not be applied to situations where two-dimensional or three-dimensional models are needed to represent local hydraulic conditions. GSTAR-1D is based on the sub-channel concept. Secondary currents, transverse movement, transverse variation, and lateral diffusion are ignored. Therefore, the model cannot simulate such phenonmena as river meandering, point bar formation, pool-riffle formation, and many plan form changes. It may not be able to simulate local deposition and erosion caused by water diversions, bridges and other instream structures. GSTAR-1D is currently compiled to run only within the Windows 2000/XP operating system.

Features

- GSTAR-1D can simulate steady and unsteady flow and is stable for any combination of sub- or super-critical flow.
- Dentrendic or looped channel networks.
- Sediment concentration can be tracked with either the Exner or advection-dispersion equations.
- Changes to bed material gradations can be simulated and multiple bed layers can be tracked.
- Many different sediment transport capacity formula are available.
- Cohesive or non-cohesive sediment transport.
- Bank erosion simulated using angle of repose conditions.
- Channel geometry data is similar to HEC-RAS.
- Excel can be used to quickly generate input files.
- Output is in structured text files that can be directly imported into TECPLOT.

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